

information about various systems of aircraft 10, information related to flight/mission planning, maps and any other information that may be useful for the flight crew during operation of aircraft 10. Display devices 14 may facilitate dialog between the flight crew and various systems of aircraft 10 via suitable graphical user interfaces. Flight deck 12 may comprise one or more data input devices such as, for example, one or more cursor control devices 20, one or more multi-function keypads 22 and one or more (e.g., standalone or multifunction) controllers 23 that may permit data entry by the flight crew. For example, such controller(s) 23 may be disposed in the glare shield above one or more display devices 14.

[0044] Part or all of display areas 16 may be dedicated to a specific type of aircraft display, such as a Primary Flight Display (PFD), a Crew Alerting System (CAS), a Heads Up Display (HUD) an Engine-Indicating and Crew Alerting System (EICAS) and/or a Multi-Function Display (MFD). The PFD displays flight information such as pitch and roll characteristics, aircraft orientation with respect to the horizon, stall angle, a runway diagram, airspeed, altitude, vertical speed, and magnetic heading of the aircraft. Other flight information may also be displayed. The EICAS displays information regarding aircraft engines and other systems instrumentation and crew annunciations. Examples of engine information displayed on the EICAS are revolutions per minute, temperature values, fuel flow and quantity, and oil pressure. Examples of other aircraft systems having parameters displayed on the EICAS are hydraulic, pneumatic, electrical, deicing, environmental, and control surface systems. Other aircraft system information may also be displayed. The MFD displays any additional information used to complement the PFD and/or EICAS. For example, the MFD may display a navigation route, moving map, weather radar, traffic collision avoidance system (TCAS) information, ground proximity warning system (GPWS) information, and airport information. Other complementary information may also be displayed.

[0045] FIG. 2 shows a schematic representation of aircraft 10, illustratively comprising input device(s) 30, aircraft system(s) 32, display device(s) 14, and performance limitation system 34. Input devices 30 may include one or more sensors, such as sensors for measuring pressure, position, acceleration, temperature, or the like. Input devices 30 may also comprise one or more of the data input devices provided on the flight deck 12, as illustrated in FIG. 1. One or more sensed parameters and/or one or more data inputs may be provided to aircraft systems 32 via input devices 30. Aircraft systems 32 are operatively connected to display devices 14, for populating the PFD, CAS, HUD, MFD, and any other display 14 provided on the aircraft 10.

[0046] At least one of the aircraft systems 32 is a flight control system (not shown). In some embodiments, the flight control system comprises one or more flight computers that receive control inputs and direct movement of flight control surfaces, such as stabilizers, elevators, rudders, ailerons, spoilers, and the like. Different aircraft may be composed of different flight control surfaces. The flight control system is designed to meet aircraft specific performance specifications related to stability augmentation, automatic guidance and navigation, and thrust management. In order to account for fault tolerance, the flight control system is provided with failure and/or fault detection and reconfiguration. When a non-normal event occurs, one or more aircraft systems,

components and/or elements may be unable to perform their designed function or meet the performance specifications originally set out, thus leading to a reconfiguration of the flight control system whereby performance limitations are determined. Performance limitations may be related to a specific flight control surface, such as a rudder or an aileron, or to an operating parameter of the aircraft, such as airspeed, altitude, or acceleration. Separate performance limitations may be assigned for each flight control surface having a reduced or modified capability. Separate performance limitations may be assigned for each operating aircraft or system parameter of the aircraft having a reduced or modified capability. Alternatively, a performance limitation may be applicable to more than one aircraft and/or system parameter, as will be explained in more detail below.

[0047] The performance limitation system 34 is configured to display a graphical indicator of at least one performance limitation on any one of the existing display devices 14 of the aircraft 10. The graphical indicator of the performance limitation is displayed so as to be co-located with the aircraft or system parameter to which it relates, on a display of the aircraft for the related aircraft or system parameter. The indicator of the performance limitation may be displayed in a manner that overlays, or is superimposed over, a graphical representation of the aircraft or system parameter to which it relates. For example, if the performance limitation is a maximum airspeed for the aircraft that is imposed as a result of a reconfiguration of the aircraft upon detection of a non-normal event in-flight, then a graphical indicator of the maximum airspeed in accordance with the active performance limitation is displayed co-located with the actual airspeed on an airspeed gauge of the PFD. For example, the graphical indicator of the maximum airspeed in accordance with the active performance limitation may be overlaid on an airspeed gauge or scale, so as to visually indicate to a crew member an airspeed not to be exceeded. If the performance limitation is a maximum engine temperature imposed as a result of a reconfiguration of the aircraft upon detection of a non-normal event in-flight, then a graphical indicator of the maximum engine temperature in accordance with the active performance limitation is displayed co-located with the actual engine temperature on a temperature gauge of the CAS. For example, the graphical indicator of the maximum engine temperature in accordance with the active performance limitation may be overlaid on the temperature gauge or scale, so as to visually indicate to a crew member an engine temperature not to be exceeded. The graphical indicator of the performance limitation is provided in addition to all of the information already available on the aircraft instrument, such as an over-speed bar on an airspeed tape or an engine overheating zone on the engine temperature gauge. The performance limitation is dynamically set upon detection of a non-normal event as a result of a reconfiguration of the aircraft. Therefore, the graphical indicator of the performance limitation may only be provided in-situ and differs from pre-set limits for various aircraft and system parameters.

[0048] Performance limitation system 34 may be coupled to input devices 30, aircraft systems 32, and display devices 14. Alternatively, performance limitation system 34 is only coupled to one or more of aircraft systems 32, such as a flight control system, and graphical presentations generated by performance limitation system 34 are integrated into display information by one or more of the aircraft systems